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Does entrepreneurial activity matter for economic growth in developing countries?

The role of the institutional environment

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Abstract: The discussion on which institutions determine entrepreneurial activity – and the role of institutions in the aggregated output for developing countries – is as yet unresolved. The extant literature about entrepreneurship recognizes new ventures as potential mechanisms for long-term development. Yet, there is a consensus on the lack of evidence, particularly for these countries. Drawing on institutional economics, this article explores the interrelationships among institutional environment, entrepreneurial activity, and economic growth. To this end, we use simultaneous-equation panel data models for a sample of 14 developing countries (78 observations) over the period of 2004–2012. The main findings suggest a causal chain running from institutions to opportunity entrepreneurship, which is linked to the economic growth of emerging economies. In particular, we find that institutional factors – such as the number of procedures to start a new business, private credit coverage, and access to communication – influence entrepreneurial activity driven by opportunity. Policy implications for developing countries could be derived in order to enhance their economic performance through entrepreneurial activity.

Keywords: Institutions, entrepreneurial activity, economic growth, developing countries.

1. Introduction

There is public policy interest in identifying the backward and forward links in the field of entrepreneurship (Aparicio et al. 2016a; Audretsch 2012; Bjørnskov and Foss 2016; Bosma et al. 2018; Carlsson et al. 2013). Acs et al. (2016), Arshed et al. (2014), Fotopoulos and Storey (2019), and Shane (2009), among others, have discussed the importance of identifying

the factors affecting the entrepreneurial activity that add value to the economy at the regional and national levels. According to Mazzucato (2013), public policies promoting entrepreneurship could have deleterious effects, since they might destroy employment in the long-term. Thus, some authors have emphasized the importance of focusing on specific entrepreneurial activity with growth potential (Block et al. 2017; Ferreira et al. 2017; Öner and Kunday 2016). The abilities to innovate and recognize opportunities are among the most salient characteristics that new firms must command in order to generate knowledge spillovers and, consequently, stimulate economic growth in various regions and countries (Acs et al. 2012; Audretsch and Keilbach 2008; Minniti and Lévesque 2010; Siu and Martin 1992; van Praag and Versloot 2007; Wennekers and Thurik 1999). On the one hand, Acs et al. (2012), Audretsch and Keilbach (2008), Audretsch et al. (2008), and Minniti and Lévesque (2010), among others, have found that those types of entrepreneurship related to innovation processes, and that those that are driven by opportunity are highly influential for economic growth. On the other hand, comparisons at the country level suggest that the final aggregated output responds to the productive endowments, such as entrepreneurial activity, which is highly influenced by institutional differences (Aidis et al. 2012; Bruno et al. 2013; Bruton et al. 2009; Urbano et al. 2019a). Thus, addressing the complexity involved in the interrelationship among institutions, entrepreneurial activity, and economic growth should be the basis for public policy development.

Although the relationship among institutional environment, entrepreneurship, and economic growth has been previously considered, the extant literature is still separated into research silos and fraught with ambiguities. Additionally, the weak institutional foundations in developing countries, along with their higher levels of necessity entrepreneurship, are some of the characteristics that underline the importance of conducting studies of these economies. Thus, new evidence should guide policy debates to facilitate opportunity-driven entrepreneurship, and ultimately generate higher levels of economic growth in the long term (Bruton et al. 2009; Bruton et al. 2010; Minniti and Lévesque 2010). Although previous studies provide several examples of the enormous number of academic articles exploring these two relationships, the existent research is also useful to demonstrate that literature is divided into two strands (Carlsson et al. 2013). Accordingly, the first strand relates to the antecedents of entrepreneurial activity, which suggest that the institutional factors, among others, affect the type and quantity of entrepreneurship (Thornton et al. 2011). The second strand of research explores the consequences that entrepreneurship brings to economic growth and development (e.g. Acs et al. 2012; Audretsch and Keilbach 2008; Bjørnskov and Foss 2013; Carree et al. 2002, 2007; Liñán and Fernandez-Serrano 2014, among others). This literature suggests that the growth process requires a higher quality of entrepreneurial activity, in which more favorable institutional environments enhance the innovation and opportunity-recognition process (Audretsch and Keilbach 2008). To some extent, these two strands are not only complex to address empirically, but they can also interact simultaneously, generating a reinforced loop. Specifically, for developing countries, the economic growth engine might be affected due to the lack of supporting institutions related to entrepreneurship (Acs et al. 2008).

Therefore, this paper seeks to explore the interrelationships among institutional environment, entrepreneurial activity, and economic growth. We analyze in depth a sample of 14 developing countries in the period of 2004–2012. In particular, our modelling approach uses the generalized least square (GLS) estimation, which is useful to understand and embrace the simultaneous causality between institutional environment and entrepreneurial activity, which is, at the same time, an important factor in the national productivity. As expected, our findings provide evidence of simultaneous and rich interactions among institutional environment, entrepreneurial activity, and economic growth. Some factors, such as the number of procedures required to start a new business, the private credit coverage, and the access to communication are most significant in explaining the opportunity entrepreneurship required for economic growth in developing countries. In addition, as a robustness check, we have performed the same simultaneous model in an entire sample of 43 countries (developed and developing), which enables us to validate that our approach to the causal chain is accurate, and thereby the results may serve as inputs to the policy debates for developing countries.

These results are key to discussing contributions to theory, knowledge, and policy. First, we build on North and Thomas (1973) to suggest entrepreneurship as a mechanism that helps developing countries to obtain higher levels of economic output. Entrepreneurs not only absorb knowledge and cause it to spillover across society (Acs et al. 2009; Audretsch and Link 2019), but they are also catalysts of social and economic change. Second, entrepreneurship research and scholars in this area may be interested in these findings as a useful insight into the role of institutions and entrepreneurship in the economic growth of developing countries. In particular, this research may advance knowledge that exists thanks to the suggestive evidence for developed countries (cf. Bosma et al. 2018), as it serves to compare the capacity entrepreneurs have for transferring institutional change into development results. Third, policymakers may find our results and discussion helpful to design and suggest policy tools that can affect entrepreneurs in the short- and long-term (Shane 2009). Throughout our analysis, it may be possible to disentangle some factors (e.g. credit coverage and infrastructure) that are sensitive for entrepreneurs in developing countries.

The remainder of this paper is organized as follows. In the next section, we present the theoretical framework related to institutional economics. Then, we outline the econometric modeling approach and describe the data used. Next, we report the empirical results. Lastly, we discuss some policies and public strategies for developing countries, and we conclude with the main implications of this paper and suggestions for future research.

2. Institutional environment for entrepreneurship and economic growth

Institutional economics (North 1990, 2005) is the framework used in this paper, since it enables the understanding of the contextual variables embedded within the economic development process. In this regard, North (1990, 2005) defines institutions as: “the rules of the game” that guide human interactions to perform tasks in harmony, so as to achieve better societies. Throughout stylized facts, it is possible to observe that there are differences among the institutions of different regions and countries, due mainly to their cultural and regulatory

constraints (North 1990, 2005). Thus, North's works define societies as being either limited (e.g. developing countries) or open (e.g. developed countries). In the developing country context, it is possible to see that they are less prosperous than developed countries. Not only is the intentionality toward social progress higher in open societies, but there is also better coordination among the agents playing key roles in the development process (North 1990). Thereby, institutions in developed countries can generate better results in terms of efficient regulations and laws, which in turn also depend on cultural embeddedness. Institutions, therefore, reduce the uncertainty that causes some constraints, thus reducing transaction costs (North 2005). North and Thomas (1973) offer a deep reflection on how institutions are eventually transmitted to economic outcomes. These authors suggest that proximate determinants (i.e. productive activities) explaining growth have backward links to institutions, so depending on the type of formal rules, culture, etc., certain activities exist to define the level of economic growth. Although regulations and culture interact constantly, it is worth emphasizing that the former change rapidly, while the latter tends to endure for a longer period (Williamson 2000). In this case, economic growth depends on how people adapt themselves to the existing institutional context and institutional change (North 2005; North and Thomas 1973).

Particular efforts by governments or individuals could generate a fertile environment, conducive to progress in each societal context (North 2005). According to Bruton et al. (2010) and Urbano et al. (2016), the attention to institutional contexts is especially helpful in understanding entrepreneurial activity as driven by different motivations (e.g. opportunity, necessity, innovation, etc.). Hence, the different motives of individuals toward entrepreneurial behavior could depend on the environment to which they belong and thus could establish the path dependence to accomplishing higher development levels (Bruton et al. 2010, p. 426). Thus, institutional economics as a theoretical framework has gained interest and relevance among those scholars within the entrepreneurship research field (Aidis et al. 2008; Salimath and Cullen 2010; Thornton et al. 2011; Urbano et al. 2019b; Welter 2011; among others). For instance, in terms of the existing literature on institutions and entrepreneurship, Bruton et al. (2009) analyze the institutional differences in some Latin American and Asian countries. Regarding the importance of entrepreneurship to achieving economic growth, Carree et al. (2002, 2007) – by distinguishing between the different development stages – have found that these two variables are recursively linked in the long run. Similarly, Sanchis Llopis et al. (2015) have introduced a series of articles devoted to understanding the cyclical behavior of entrepreneurship and macroeconomic variables, such as employment, gross domestic product (GDP), and other factors. In this sense, part of the literature has argued that based on the types of laws, regulations, procedures, entrepreneurial acceptance, and culture, among other characteristics, entrepreneurs shape their capacity to create social value and economic growth (Aidis et al. 2008; Chowdhury et al. 2019; Salimath and Cullen 2010; Welter, 2005; among others).

There are other examples of literature focused on institutions and entrepreneurship. Gnyawali and Fogel (1994), for instance, have suggested a related approach to exploring the institutional environment based on five dimensions for entrepreneurship development. The framework comprises institutions at the macroeconomic level – (1) government policies and

procedures and (2) social and economic factors – as well as infrastructure and services, including (3) financial assistance and (4) non-financial assistance; and those characteristics closer to the individual who is making decisions: (5) entrepreneurial and business skills (Gnyawali and Fogel 1994, p. 46).

By conducting analysis of these five environmental factors, it is possible to understand how different institutional settings facilitate or hamper entrepreneurial activity in developing countries (Schillo et al. 2016). Hence, by embracing the analysis of institutions, it is possible to discuss policy implications aimed toward better economic outcomes, in which entrepreneurship organically links the public strategies and productivity growth across nations (Baumol 1990; McMullen et al. 2016; Minniti 2016). For example, different analyses have been conducted of those institutions affecting entrepreneurship in a sample of Latin American countries, taking these dimensions into consideration (Aparicio et al. 2016a; Bernat et al. 2017). Similarly, Bruton et al. (2009) have analyzed the institutional differences between Latin American and Asian countries. One interesting conclusion derived from this work is that supportive institutions explain the progress in innovation, entrepreneurship, and industry development in some Asian countries. Manolova et al. (2008), like the authors of the previous works, have used institutional analysis to explore those factors promoting entrepreneurship development in developing countries, specifically in Eastern Europe. Despite these advances, the extant literature still lacks empirical explorations on Gnyawali and Fogel's (1994) dimensions that influence entrepreneurial activity (Aparicio et al. 2016a). This scarcity of literature is also identified in the work of Boettke and Coyne (2009), Elert and Henrekson (2017), Urbano et al. (2019b), and Zhai et al. (2019), who analyze and classify the existing amount of research about institutions and entrepreneurship. Accordingly, these authors find that most of the studies focus on the distinction between formal and informal institutions, in which the former are more explored than the latter. Urbano et al. (2019b), for instance, identify that existing scholarship tends more often to investigate variables such as taxes, property rights, contracts, and political factors related to freedom. Zhai et al. (2019) complement this view by observing that cultural values, networks, cognitive factors and market dynamics are, among others, the most frequent (informal) institutions that scholars examine. Based on these literature reviews, it is suggested that variables related to the environment that affects the entrepreneurial process, in which proxies for the five dimensions that Gnyawali and Fogel (1994) suggest, need further attention. In this regard, we approach the framework by empirically analyzing institutions such as the number of procedures required to start a new business and the human development context (the government procedures and social and economic factors at the country level); the capacity for recognizing new opportunities in the market (entrepreneurial and business skills); private credit coverage (financial assistance); and access to communication (as a non-financial assistance dimension).

The aforementioned examples provide a starting point for exploring the institutional differences across countries, and their effect on entrepreneurial activity and economic growth. Yet, there exists little literature analyzing those institutions related to regulations, which tend to negatively influence entry decisions in developing countries (Autio and Fu 2015). Thus, by drawing on Gnyawali and Fogel (1994) and Manolova et al. (2008), it is

possible to suggest that a higher extent of regulations could deter entrepreneurial activity in both developed and developing economies (Djankov et al. 2002). Gnyawali and Fogel (1994) suggest that regulations such as procedures or laws are generally perceived negatively by potential entrepreneurs. Some authors, such as Begley et al. (2005), McMullen et al. (2016), and van Stel et al. (2007), among others, argue that entrepreneurs may be discouraged from starting a business if they have to follow many rules and procedures. There is empirical evidence about the negative effect of the number of procedures on entrepreneurial activity, which suggests new elements of entrepreneurship policies (Djankov et al. 2002; van Stel et al. 2007). For instance, simplifying certain regulations was the most popular reform during the years 2007 and 2008, implemented in 49 countries (Djankov et al. 2010). According to Belitski et al. (2016), Chowdhury et al. (2019), Djankov et al. (2002), and Tanas and Audretsch (2011), higher regulation of entry is generally associated with more corruption, less democratic government without visible social benefits, and a larger unofficial or underground economy. Comparison across countries may lead to different conclusions, given their nature and the degree of government efficiency. For instance, Prantl and Spitz-Oener (2009) analyzed the influence of entry regulation on self-employment and found marked differences for emerging economies. They suggest that developed countries tend to have more regulations than developing countries, which at the same time have a greater effect on deterring entry into self-employment. Thus, the effect of higher regulation reduces the intention to create new businesses in developed regions compared to developing ones. Similarly, Aparicio et al. (2016a) suggest that Latin American countries have a more pervasive unofficial economy than high-income countries. Consequently, entrepreneurs avoid several formalities and procedures for starting a business. Essentially, in these countries, there are fewer social and legal pressures to enforce rules and regulations. In that regard, van Stel et al. (2007) provide evidence that the number of procedures to start a business, although having a negative impact on entrepreneurial activity, has a smaller effect in developed economies. Accordingly, the following hypothesis is proposed:

Hypothesis 1: The number of procedures for starting a business has a negative influence on entrepreneurial activity in developing countries.

Even though regulations and laws are widely accepted as institutions affecting entrepreneurial activity, social and economic conditions are additional institutional factors proposed in Gnyawali and Fogel's (1994) work. Essentially, these are considered as institutions due to the implicit and explicit market rules that allow for the interplay among households, incumbent firms, and well-established industries. The environment these elements represent leads to creating additional entrepreneurial opportunities that can be turned into new jobs, well-being, and economic growth (Gnyawali and Fogel 1994). Similarly, Baumol (1990) and Minniti (2016) have posited that certain types of entrepreneurship (e.g. innovative and opportunity-driven) may emerge if there is an appropriate economic environment that encourages nascent inventors, entrepreneurs, manufacturers, and others. In this regard, it is argued that entrepreneurship is placed at the core of economic analysis as the mechanism creating human development (Baumol 1990; Gries and Naudé 2011). Nonetheless, the same authors recognize that entrepreneurial activity is a net result in itself, which is urged in environments with higher levels of development. In

a similar line of thought, Urbano et al. (2019a) show that those societies characterized by an orientation toward social progress tend to create incentives for innovative entrepreneurs, who are expected to contribute with social solutions. Hence, although the literature is scarce, we expect that societies that are more human-oriented will have an environment that overcomes market failures and enables the emergence of entrepreneurial activities that are useful for the development process. For example, Carree et al. (2002, 2007) have explained that the level of economic development partly affects the number of entrepreneurs in each country. These authors have found that there exists a type of U-shaped curve between entrepreneurship and economic development, in which developing countries have higher numbers of entrepreneurs motivated by necessity issues, whereas in developed countries, one finds entrepreneurial activity based more on opportunity recognition. Similarly, other studies such as the work of van Stel and Carree (2004), Wennekers et al. (2005), and Acs et al. (2008), have provided evidence of the U-shaped or L-shaped curve, which explains that both variables are recursively linked. According to Reynolds et al. (2005) and Bosma (2013), the total entrepreneurial activity (TEA), an index used often in previous works, implicitly contains entrepreneurship driven by opportunity, necessity, and other reasons. Thereby, opportunity entrepreneurship is related to the innovation process, the highest amount of which is found in those knowledge economies where technology, institutions, education, and other opportunities are available to entrepreneurs, encouraging them to explore, evaluate, and exploit opportunities (Reynolds et al. 2005). In contrast, necessity entrepreneurship is found in higher proportions in those countries where many market failures exist and where institutions are weak. In developing countries, where these issues remain, individuals make the decision to become entrepreneurs in order to guarantee survival and bring in the income necessary for themselves and their families (Reynolds et al. 2005). According to Acs et al. (2008), in those developing economies with higher levels of entrepreneurial activity at an early stage that face steep challenges to survive over time, that situation is largely shaped by local institutions aimed at entrepreneurs and the levels of economic development. Furthermore, these authors suggest that a higher level of economic development gives greater incentives to incorporate in the markets, which are reflected in the benefits of greater access to formal financing and labor contracts, as well as in the tax system and standard of living. Therefore, we propose the following hypothesis:

Hypothesis 2: *A more favorable human development context has a positive effect on entrepreneurial activity in developing countries.*

Passing from opportunity to the creation of a new venture necessitates that governments and economic systems behave in a coordinated manner, such that the entrepreneur perceives conditions as being conducive to their venture (Gnyawali and Fogel 1994). In this sense, opportunity recognition might be the result of social and economic interactions (Aidis et al. 2008; Davidsson et al. 2018). Guerrero et al. (2015) explain that this institutional factor is perceived within the university dynamics, where potential entrepreneurs are exposed to different socialization processes (e.g. classes, seminars, contests, etc.). To the extent that universities, government, and society align their purposes, future entrepreneurs may obtain the necessary knowledge and skills required to better recognize the existing opportunities in the market (Audretsch 2014). Thus, in terms of entrepreneurial and business skills, it is

suggested that particular knowledge in entrepreneurship, experience, and the capacity to recognize market necessities, and therefore, opportunities to create new business are relevant to carry out an entrepreneurial process (Gnyawali and Fogel 1994). Gnyawali and Fogel's (1994) work underlines the relevance of this factor in developing countries, which are characterized by lower levels of business skills. Some studies provide support for this idea. For example, Swason and Webster (1992) find that entrepreneurs in the Czech and Slovak Republics identify better opportunities if they receive training in business plan preparation, planning, decision-making, negotiation, pricing, market penetration, organization and management, management of the workforce, and handling of cash flow. Urbano et al. (2018), by analyzing a group of Latin American countries, find that secondary education may provide an environment for teenagers to receive particular knowledge in entrepreneurship, which could lead them to identify entrepreneurial opportunities in the short and long term. Hence, it is possible to argue that opportunity recognition might be an institution that results from entrepreneurial alertness and social networks (Aidis et al. 2008; Hughes et al. 2007). In this regard, some evidence has been provided about Russian and British entrepreneurs, for whom networks were key resources to opportunities, which in turn impacted positively on entrepreneurial activity (Aidis et al. 2008; Hughes et al. 2007). Aldrich and Cliff (2003) have obtained similar results for US entrepreneurs, who enhanced opportunity recognition through the transformation of family embeddedness. According to Aldrich and Cliff (2003), changes in family composition have implications for opportunity recognition, which is an attitude required to start a new venture. Similarly, Ozgen and Baron (2007) found that mentors, informal industry networks, and professional forums are networking sources that encourage opportunity recognition, which at the same time is positively related to entrepreneurial activity. Hence, opportunity recognition has been suggested as a tool for detecting meaningful patterns required for valuable entrepreneurial activity (Arenius and De Clercq 2005; Baron 2006; Baron and Ensley 2006). Furthermore, according to the literature review conducted by Sahut and Peris-Ortiz (2014), opportunity recognition is a common element in small-business performance, innovation, and entrepreneurship. Therefore, we propose the following hypothesis:

Hypothesis 3: Opportunity recognition has a positive influence on entrepreneurial activity in developing countries.

Within the entrepreneurship development process, Gnyawali and Fogel (1994) claim the necessity of a complete economic system, in which banks, private funds, and venture capitalists, among others, constitute the financial elements. As such, these actors at the individual and aggregate levels create and respond to norms (e.g. interest rates, bankruptcy laws, availability level of loans, etc.) (Autio and Fu 2015). Some research explores how different incentives attract private equity through public policy. In this sense, Cumming et al. (2018) explore how public policies about entrepreneurial finance might increase the level of innovation and entrepreneurship and, ultimately, economic growth. In their view, entrepreneurial finance is a policy mechanism that aims to help new ventures from inception to survival and eventually growth. The institutional aspect becomes significant when there are gaps within and across countries (Wright et al. 2005), as well as when certain frictions exist among financial platforms (Cumming et al. 2018). In the end, well-established

institutions help people to afford different funding alternatives. Due to this, the emergence and evolution of funding alternatives determine the quality of financial sources and their influence on entrepreneurship. Hence, Bruton et al. (2015, p. 15) explain that:

[...] a core concern for growing entrepreneurial ventures is how the opportunities for entrepreneurs to move through stages of financing vary. For example, developed countries offer a range of financing options at all stages of firm growth. However, in developing economies, financing alternatives are more limited.

Although there is plenty of literature analyzing this factor, there is still a need to explore in depth how easy it is to obtain credit and how this availability or void might be a vehicle or barrier for entrepreneurs in developing countries, where there might be financial constraints (Aparicio et al. 2016a). Van Auken and Neely (1999) suggests, for instance, that those individuals with entrepreneurial intentions but no access to the financial system tend to face greater risks and have a lower survival rate than do those entrepreneurs with financial support. Likewise, entry barriers related to this issue could hamper the entrepreneurial process, as well as cause higher exit rates (von Broembsen et al. 2005). Some studies highlight the fact that increasing access to bank credit, the creation of investment companies, credit with low interest rates, and credit guarantee schemes, among others, could be particular strategies for the promotion of entrepreneurship (Coad et al. 2016; Gnyawali and Fogel 1994; van Gelderen et al. 2005). The accuracy of public strategies related to funding could serve not only the start-up process, but also the capacity for sustainability and survival of the new business (von Broembsen et al. 2005). Black and Strahan (2002) find that in the case of the US, the rate of new start-ups has increased following the easing of branching restrictions, and also that deregulation reduces the negative effect of concentration on new start-ups. Inequalities in terms of income, age, and gender, among other factors, are harmful for the consolidation of any financial system. In this regard, Marlow and Patton (2005) suggest that the access to credit must overcome dangerous concentrations derived from gender inequalities in order to encourage entrepreneurial behavior across regions and countries.

Regarding the importance of access to bank credit for developing countries, Wang (2012) finds that in the case of China, certain internal reforms led to reduced labor mobility costs and alleviated credit constraints in order to achieve higher rates of entrepreneurship. However, reforms in terms of credit access in developing countries require the removal of barriers to obtaining more credit (Fatoki and Odeyemi 2010). In that context, Maas and Herrington (2006) and Herrington et al. (2009) claim that access to finance is a major problem for South African entrepreneurs. According to them, a lack of financial support is one of the main reasons for the low level of new firm creation, as well as the failure of new firms in South Africa. Fatoki and Odeyemi (2010) argue that many entrepreneurs obtain financial support from their own or their families' savings, which are often inadequate, rather than approaching formal banks or other firms for external finance. Thus, especially for developing countries, having access to bank credit might provide a smooth path for entrepreneurial development, which supports the idea that funding issues are highly relevant to increasing the added value of entrepreneurial activity (Gnyawali and Fogel 1994; Martínez and Puentes 2018). Therefore, the following hypothesis is proposed:

Hypothesis 4: Access to bank credit has a positive influence on entrepreneurial activity in developing countries.

Following the dimensions analyzed in Gnyawali and Fogel's (1994) work, non-financial assistance has to do with support services, entrepreneurial networks, incubator facilities, modern transport, and communication facilities. These elements represent the institutional environment that may pave the way for competitiveness and development, which are necessary for entrepreneurship (Acs and Amorós 2008; Terjesen and Amorós 2010). Gnyawali and Fogel (1994) argue that the last step for turning an opportunity into a new venture is conditioned by the capacity that a country has to offer physical connections among firms, markets, and other relevant entities. For instance, Ács et al. (2014) have analyzed the national system of entrepreneurship and its link to economic development, showing that the system requires an additional gear to complete the complex engine. Namely, entrepreneurs need information and market knowledge (through communication and technology) and connections to the internal and external markets (through infrastructure such as highways, roads, ports, etc.), among other elements. Thereby, Ács et al. (2014) agree with the idea that the institutional factor represented by communication and infrastructure plays a crucial role in the entrepreneurship and economic development processes, and thus further research should be conducted, especially for emerging economies. Overall, developing countries might be characterized by low levels of infrastructure (entrepreneurial and innovation ecosystems, telecommunications, roads, etc.), which to some extent distort the decision to become an entrepreneur.

Audretsch et al. (2015) investigate the relationship between different types of infrastructure and entrepreneurial activity. Even though physical infrastructure also plays a significant role in entrepreneurship in developing countries (Hechavarría and Ingram 2019; Padilla-Pérez and Gaudin 2014), scholars highlight communication infrastructure as a platform for entrepreneurship. Communication offers greater access not only to information, but also to the possibility of exploring other entrepreneurial alternatives. Accordingly, opportunity-driven entrepreneurs in developing countries may identify new opportunities through digital and online channels (McAdam et al. 2019; Ngoasong 2018), as well as through the sharing economy (Alrawadieh and Alrawadieh 2018; Muñoz and Cohen 2018), and that they might take advantage of the fewer regulations compared to developed countries. In this respect, the Audretsch et al.'s (2015) work is useful to understand that although infrastructure generally influences entrepreneurship, broadband and communications technology are special tools for new businesses. Moreover, infrastructure facilitates connectivity and recognition of entrepreneurial opportunities (Audretsch et al. 2015; Bennett 2019). It is also worth mentioning that Audretsch and et al.'s (2015) work hypothesizes that having a good communication infrastructure may lead to entrepreneurial activity in industry sectors such as software. Also, Padilla-Pérez and Gaudin (2014) presented an analysis of Central America, where investment in infrastructure for innovation and entrepreneurship has increased in the past decade. They found that improvements in infrastructure have been relevant to the development of entrepreneurship and innovation in these countries. Wood and McKinley (2017) show that connections and communications among places are important not only for

distribution, but also for discovering new entrepreneurial opportunities. Thus, the literature emphasizes the relevance of public policies for enhancing infrastructure development and ensuring access to the Internet and cell-phone networks, among other communication technologies, which are scarce in those emerging economies. Thus, the following hypothesis is proposed:

Hypothesis 5: *Access to communication has a positive influence on entrepreneurial activity in developing countries.*

Once hypotheses probing the institutional context for entrepreneurship development have been posited, it is important to understand the underlying mechanisms playing a key role in economic growth. Drawing from Rodrik (2003) and Bjørnskov and Foss (2016), it is possible to propose a causal chain from institutions to economic growth, in which entrepreneurial activity is one of the mediating factors contributing to the final output. Since the work of Schumpeter (1911), there has been a body of scholarship that relates entrepreneurship to economic outcomes. For instance, Minniti and Lévesque (2010) have recently developed a mathematical model to demonstrate how innovative entrepreneurship could impact long-term economic growth. According to these authors, entrepreneurial activity located in developed economies tends to be more innovative than does entrepreneurship in developing economies. According to Reynolds et al. (2005), developing countries concentrate high levels of overall entrepreneurship (measured through total entrepreneurial activity, TEA) and necessity TEA, which have been reliable measures in exploring the relationship between entrepreneurship and economic growth (Acs et al. 2008; Liñán and Fernandez-Serrano 2014; Urbano and Aparicio 2016; van Stel et al. 2005; Wennekers et al. 2005; Wong et al. 2005, among others). Concerning public policies in terms of entrepreneurship in developing countries, some key questions arise about the factors encouraging innovative entrepreneurs (e.g. opportunity TEA), which are also related to economic growth (Bruton et al. 2013; Minniti and Lévesque 2010). Naudé (2010, 2011) argues that if the demand for entrepreneurship is higher in developing countries, as is normally expected, entrepreneurship is a more salient factor in these countries than in developed ones. Sanyang and Huang (2010) follow the previous notion, discussing the importance of programs that support entrepreneurial initiatives in developing economies.

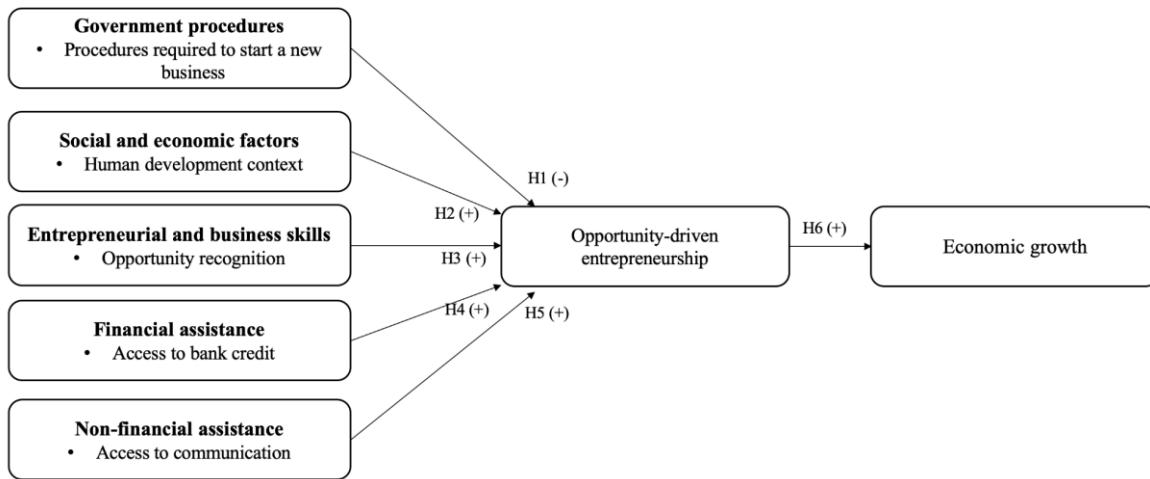
In general, it has been established that innovation and knowledge play an important role in economic growth. For instance, the work of Romer (1986) includes a variable of knowledge in the neo-classical production function. Nevertheless, Acs et al. (2012) point out that knowledge requires a mechanism that translates the effect on growth and development. Accordingly, Agarwal et al. (2007), Audretsch and Keilbach (2008), and Noseleit (2013), among others, converge on the conclusion that entrepreneurship is the vehicle needed to achieve the connection among different variables affecting economic growth. Therefore, and according to Reynolds et al. (2005), opportunity TEA can be considered as the net result of individual decisions to pursue entrepreneurial initiatives based on knowledge. Here, opportunity TEA can be associated with an innovative orientation. Some authors have come to recognize the capacities of potential entrepreneurial innovation and growth and their significant contribution to prosperity and economic welfare (Acs and Armington 2006;

Ferreira et al. 2017; Levie and Autio 2008; Schramm 2006). According to Audretsch et al. (2008), entrepreneurs take knowledge-based opportunities and develop them into new products. This increases the amount of knowledge spillover and has a positive impact on economic performance (Audretsch et al. 2008). These authors also argue that innovative entrepreneurs who invest in the development of new products and services based on new knowledge as a business opportunity can then take advantage with respect to other entrepreneurs. Therefore, opportunity entrepreneurship is an important mechanism in the transformation of new knowledge into economic performance (Audretsch et al. 2008). In this context, Wong et al. (2005) point out that the rates of opportunity TEA reflect the creation of knowledge and technology and could impact positively on economic growth (Acs et al. 2012; Noseleit 2013; Valliere and Peterson 2009). Thus, we propose the following hypothesis:

Hypothesis 6: *Opportunity TEA has a positive effect on economic growth in developing countries.*

We summarize our main hypotheses in Figure 1.

Figure 1. Proposed conceptual model



3. Methods

Since entrepreneurship and economic growth are interrelated, our approach relies on a simultaneous equation model. We assume an initial model where institutions influence entrepreneurial activity. Thus, our first equation takes this structure explicitly into account controlling for other variables that also may affect entrepreneurship. In its general form, this equation is written as:

$$EA_{it} = f(IE_{it-1}, v_{it-1}) \quad (1)$$

where IE_{it} is the vector representing the institutional environment, and v_{it} is the controlling vector that influences entrepreneurship in developing country i at time t . The vector of controls refers to the economic growth rate, population density, and population older than 15 years of age (which captures the labor force participation), and the square value of the latest variable.

As mentioned previously, the relationship between entrepreneurship and economic growth has been widely explored (Acs and Szerb 2007; Audretsch et al. 2008; Mueller 2007; Noseleit 2013; Wennekers and Thurik 1999). Nonetheless, to specify the sequence of the institutional environment, entrepreneurship, and economic growth, an augmented production function that includes an explicit measure of entrepreneurship is estimated. On this basis, we are able to test the influence of the institutional environment on entrepreneurial activity, on the one hand, and the effect the latter variable exerts on economic growth, on the other. The next equation is a Cobb–Douglas production function of the form:

$$Y_{it} = \alpha \widehat{EA}_{it}^{\beta_1} K_{it}^{\beta_2} GC_{it}^{\beta_3} E_{it}^{\beta_4} HE_{it}^{\beta_5} L_{it}^{\beta_6}$$

Our endogenous growth model follows Romer's assumption (1986, p. 1006) regarding the labor coefficient (β_6) settled in one. To some extent, this implies that externalities are not internalized, knowledge is given (and expressed through entrepreneurship), and capital is foregone consumption. Taking this into account, dividing output by labor in order to guarantee a function with constant returns to scale, and introducing lags on the right-hand side, we obtain a second equation to estimate:

$$Y_{it}/L_{it} = \alpha \widehat{EA}_{it-1}^{\beta_1} K_{it-1}^{\beta_2} GC_{it-1}^{\beta_3} E_{it-1}^{\beta_4} HE_{it-1}^{\beta_5} \quad (2)$$

where Y_{it} is the economic output of country i at time t , measured as the GDP, L_{it} represents the total labor force (hence Y_{it}/L_{it} is labor productivity, a proxy for economic growth), \widehat{EA}_{it-1} represents the endowment of entrepreneurial activity, K_{it-1} is country i 's endowment of capital, GC_{it-1} is the government consumption, E_{it-1} is exports, and HE_{it-1} is the health expenditures in each country. Thus, this formally specifies that entrepreneurship contributes to the economic growth of countries. With equation (2), our approach is an extension of that chosen by Audretsch and Keilbach (2004a,b, 2005) and Audretsch et al. (2008), who emphasize that the impact of entrepreneurship on economic growth should take into account institutional factors; therefore, we focus on these two equations. Following the appendix of Wong et al. (2005) and Acs et al. (2012) to linearize the production function, we use the natural logarithm in the variables that represent institutional factors as well as the endowments assessed in our growth model. We estimate this set of equations simultaneously, using three-stage least-squares regression (3SLS) to correct for the simultaneity bias (e.g. Intriligator et al. 1996). Similar models were assessed through this technique in the field of entrepreneurship and economic growth, unveiling its importance in estimating models with

bi-causality (Aparicio et al. 2016a; Audretsch and Keilbach 2008; Bosma et al. 2018). According to Zellner and Theil (1962) and Wooldridge (2010), the advantage of 3SLS is that it is asymptotically more efficient since it takes into account the correlation among the errors of each of the simultaneous equations of interest. The method also adjusts the weighting matrix for potential heteroscedasticity of the errors by estimating the coefficients within a generalized least square (GLS) framework, an approach outlined by Wooldridge (2010).

Thus, we use unbalanced panel data for the period of 2004–2012, which allows us to compare the various analyses offered in current literature (cf. Aparicio et al. 2016a; Bosma et al. 2018; Chowdhury et al. 2019). Due to possible biases stemming from the crisis period, different samples might affect the comparison – and therefore the debate – among studies. Likewise, this period enables us to better manage potential problems associated with missing data. Although the panel is unbalanced, most of the countries in the world have periodically contributed to the Global Entrepreneurship Monitor (GEM) project, so there might not be as many gaps as in other periods. Our dependent variable for equation 1 is opportunity entrepreneurship, which is measured through total early-stage entrepreneurial activity driven by opportunity (TEA opp), which is one of the best-known indicators of GEM. This variable shows the entrepreneurs who are motivated to pursue perceived business opportunities. Another dependent variable (Eq. 2) is the economic performance indicator, obtained through the GDP at constant 2005 USD divided by the total labor force (L), which is one of the best-known proxies for economic growth. The sources of data to measure these dependent variables are the GEM and the World Development Indicator (WDI) of the World Bank.

The data on independent variables, specifically those that reflect institutional environments, were obtained from Doing Business (the number of procedures to start a new business and credit coverage); the United Nations Development Program (UNDP; Human Development Context); the GEM Adult Population Survey (APS) (opportunity recognition); and the National Experts Survey (NES; access to communication). Meanwhile, data on GDP growth rate, population density, and population older than 15 years of age were obtained from the WDI database. The control variables assessed in a production function, such as gross capital formation (K), government consumption (GC), exports (E), and health expenditures (HE), were obtained from the WDI. The variable K is measured in constant values in 2005 USD, whereas GC is a percentage of GDP, E represents the external sales in constant values in 2005 USD, and HE is a percentage of government expenditure. We use the natural logarithm to estimate the two equations.

The final sample has 78 observations for 14 developing countries with a regular time series (2004–2012). It should be pointed out that given the availability of data regarding the human development context, we match this variable with the entire sample using information from 2005–2013. In addition to the importance of analyzing our issue regarding developing countries, as previously explained, we find that our final database contains a representative sample of this homogeneous group (Aparicio et al. 2016a). Table 1 presents the dependent and independent variables used in this study, including their sources, and Appendix 1 presents the countries. Although we conduct our analysis for emerging economies, for comparison purposes, we also estimate the same model by taking into account a sample of

258 observations associated with 43 developed and developing countries. These results are presented in Appendix 2.

Table 1 Description of variables

Equation 1		
Dependent variable	Description	Source
Opportunity Entrepreneurship (TEA opp)	Percentage of those involved in TEA (Total Entrepreneurial Activity) who (i) claim to be driven by opportunity as opposed to finding no other option for work; and (ii) who indicate the main driver for being involved in this opportunity is being independent or increasing their income, rather than just maintaining their income	GEM APS for the period 2004 to 2012
Independent variable	Description	Source
Government policies and procedures		
Number of procedures to start a new business	The number of procedures that are officially required for an entrepreneur to start up and formally operate an industrial or commercial business and the duration of these procedures.	Doing Business for the period 2004 to 2012
Socioeconomic conditions		
Human Development Context	Human Development Index. Average achievement in three basic dimensions of human development— a long and healthy life, knowledge and a decent standard of living.	UNDP 2005 to 2013
Entrepreneurial and Business Skills		
Opportunity recognition	Percentage of individuals who answer whether they perceive good conditions to start business in the area where they live.	GEM APS for the period 2004 to 2012
Financial assistance		
Private credit coverage	Percentage of adult population that has a least one credit by private bank.	Doing Business for the period 2004 to 2012
Non-Financial Assistance		
Access to communication	Average value of experts' perception about good access to communication for new or growing firms.	GEM NES for the period 2004 to 2012
Control variables		
GDP growth rate	GDP rate at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Data are in constant 2005 U.S. dollars per capita.	WDI for the period 2004 to 2012

Population density	The amount of population divided by land area in square kilometres.	WDI for the period 2004 to 2012
Population older 15 years old	Percentage of population older than 15 years old.	WDI for the period 2004 to 2012

Equation 2

Dependent variable	Description	Source
Labor productivity (Y/L)	GDP value at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Data are in constant 2005 U.S. dollars. This variable is divided by the employment to population, which is the number of a country's population that is employed.	WDI for the period 2004 to 2012

Independent variable	Description	Source
Opportunity Entrepreneurship (TEA opp)	Percentage of those involved in TEA (Total Entrepreneurial Activity) who (i) claim to be driven by opportunity as opposed to finding no other option for work; and (ii) who indicate the main driver for being involved in this opportunity is being independent or increasing their income, rather than just maintaining their income	GEM APS for the period 2004 to 2012
Gross capital formation (constant 2005 US\$)	Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Data are in constant 2005 U.S. dollars.	WDI for the period 2004 to 2012
Government consumption	Government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defence and security, but excludes government military expenditures that are part of government capital formation (% of GDP).	WDI for the period 2004 to 2012
Exports	External sales as a percentage of GDP.	WDI for the period 2004 to 2012
Health expenditure	Capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organisations), and social (or compulsory) health insurance funds. (% of government expenditure).	WDI for the period 2004 to 2012

^a Doing Business. <http://www.doingbusiness.org/>; GEM. Global Entrepreneurship Monitor (GEM). <http://www.gemconsortium.org/>; WDI. World Development Indicators (WDI) by World Bank. <http://databank.worldbank.org/data/home.aspx>; UNDP. United Nations Development Programme (UNDP). <http://hdr.undp.org/en/data>.

4. Main results

Table 2 presents the mean, standard deviation, and maximum and minimum values for developing countries, as well as the correlation matrix among the variables. On the one hand, Table 2 suggests relationships between the variables analyzed, which met our expectations in various cases. The negative correlation between TEA opp and economic growth is perhaps due to the aforementioned U-shaped curve (Carree et al. 2002, 2007; Liñán and Fernandez-Serrano 2014).

In order to test for the problem of multicollinearity, we calculated the variance inflation factor (VIF) for each individual predictor. Although 3SLS does not allow the VIF to be obtained directly, we compute this test for each equation. The VIF values are low (lower than 1.63 for equation 1 and 1.81 for equation 2). The regression analysis is presented in Table 3, where we report the estimated coefficients, as well as standard errors in parentheses for all models, which were estimated through ordinal least square (OLS), two-stage least square (2SLS), and 3SLS, respectively, in order to verify the robustness for developing countries. As an additional robustness check, we estimated throughout different techniques the two simultaneous models without control variables (models 1–3), and with control variables (models 4–6). Also, time fixed effects were included in the latest set of models to capture business cycle effects. No drastic changes were found across the models, indicating a robust structure for both equations. Overall, the models are highly significant ($p \leq 0.000$).

According to Arenius and Minniti (2005), Arin et al. (2015), Wennekers et al. (2005), Langowitz and Minniti (2007), and Bleaney and Nishiyama (2002), we include control variables related to macro-economic factors in all models estimated (GDP growth rate, population density, and share of the population older than 15 years of age, as well as the square of this variable for Eq. 1; and capital, government consumption, exports, and health expenditures for Eq. 2) in order to analyze entrepreneurial activity and its effect on economic growth. Additionally, we compute the Hausman test to check whether there are variations in the estimations obtained through OLS, 2SLS, and 3SLS. We found that the Hausman specification test does not reject the null hypothesis about the non-systematic differences in coefficients of the 3SLS and 2SLS with respect to the OLS estimation. This implies that the two sets of models estimated through different methods are well specified, since there are not higher differences with respect to both sign and magnitude. In particular, the Hausman test suggests the 3SLS estimates for inference. Additionally, according to Wooldridge (2010), OLS estimators could be less efficient and consistent with respect to 3SLS. Here, it is noteworthy that in Table 3, the standard errors of 3SLS models are lower than OLS and 2SLS. Also, not rejecting the null hypothesis of the Hausman test means that the expected value of the residuals is asymptotically zero, which implies good specification of the models (Baltagi 2005, p. 127). Thus, 3SLS is an appropriate method to estimate our set of simultaneous equations.

With regards to the testing of the hypotheses, hypothesis 1 suggests that the number of procedures for starting a business has a negative influence on entrepreneurship. The

coefficient in models 3 and 6 is negative and significant ($b = -0.192$, $p = 0.1$; and $b = -0.301$, $p < 0.05$), supporting hypothesis 1. Hence, fewer procedures for starting a business would be related to higher entrepreneurial activity, specifically for those entrepreneurial activities driven by opportunity motivation. Compared with Appendix 2, the results are consistent with the study produced by van Stel et al. (2007), who suggest that this type of regulation generates entry barriers, discouraging entrepreneurship behavior. In terms of developing countries, the higher influence of this variable on opportunity entrepreneurship could be due to the assumptions of the Doing Business project, which suggests that the reactions of entrepreneurs in these countries result from a high percentage of the members of the population being forced to start a business for their livelihood as part of the unofficial economy. In addition, the dynamic of the labor market (entry to and exit from employment or self-employment status), as well as the bureaucratic structure, could lead to the creation of new businesses with a short survival period. Therefore, a governmental structure with policies focused on reducing the procedures that increase the entry cost is needed in developing countries.

Table 2 Descriptive statistics and correlation matrix

Variable	Obs.	Mean	Std. Dev.	Min	Max	1	2	3	4
1 Ln TEA opp	78	2.002	0.615	0.102	3.387	1			
2 Ln Y/L	78	9.300	0.553	7.671	10.207	-0.224*	1		
3 Ln Number of procedures to start a new business	78	2.180	0.392	1.099	2.833	0.233*	-0.427*	1	
4 Ln Human Development context	78	-0.312	0.096	-0.633	-0.196	0.069	0.790*	-0.222*	1
5 Ln Opportunity recognition	78	3.690	0.508	1.048	4.291	0.603*	-0.416*	0.400*	-0.226*
6 Ln Private credit coverage	76	3.466	1.015	0.336	4.605	0.321*	0.383*	0.114*	0.386*
7 Ln Access to communication	66	1.314	0.138	0.806	1.517	0.165	-0.230*	0.101	0.126
8 GDP growth rate	78	3.963	3.426	-6.799	10.400	0.262*	-0.115*	0.164*	0.128
9 Ln Population density	78	3.885	0.760	2.946	5.439	-0.487*	-0.280*	-0.307*	-0.492*
10 Population older 15 years old	78	51.562	9.222	36.041	86.100	0.179*	-0.606*	0.276	-0.663*
11 Ln Capital	73	24.501	1.410	21.960	28.410	-0.017	0.177	0.068*	0.063
12 Ln Government consumption	78	2.651	0.347	1.843	3.161	-0.232*	0.338*	0.046*	0.051
13 Ln Exports	78	-13.609	1.777	-17.521	-11.339	-0.080*	0.460*	-0.439*	0.488*
14 Ln Health expenditure	78	2.487	0.419	1.548	3.226	0.494*	0.243*	-0.231	0.287*
	5	6	7	8	9	10	11	12	13
5 Ln Opportunity recognition	1								
6 Ln Private credit coverage	0.336*	1							
7 Ln Access to communication	0.050	-0.335*	1						
8 GDP growth rate	0.510*	0.181	0.164	1					
9 Ln Population density	-0.364*	-0.625*	0.148	-0.317*	1				
10 Population older 15 years old	0.325*	-0.163	0.274*	-0.005	0.336	1			
11 Ln Capital	-0.028	0.173	-0.449*	-0.039*	-0.115	-0.524*	1		
12 Ln Government consumption	-0.358*	0.184	-0.604*	-0.348*	-0.112	-0.322*	0.416	1	
13 Ln Exports	-0.220*	0.062	0.303*	0.076*	-0.031	0.021	-0.744	-0.283	1
14 Ln Health expenditure	0.286*	0.323*	0.066	0.212	-0.344*	0.166	-0.403	-0.240	0.510*

Note: * p<0.1.

Table 3 Results of simultaneous equations for developing countries

Equation 1. Dep. variable TEA opp	(1)	(2)	(3)	(4)	(5)	(6)
	Ln TEA opp	Ln TEA opp	Ln TEA opp	Ln TEA opp	Ln TEA opp	Ln TEA opp
	(OLS)	(2SLS)	(3SLS)	(OLS)	(2SLS)	(3SLS)
Government policies and procedures						
Ln Number of procedures to start a new business ($t-1$)	-0.141 (0.157)	-0.141 (0.157)	-0.192+ (0.118)	-0.272 (0.237)	-0.272 (0.237)	-0.301** (0.154)
Socioeconomic conditions						
Ln Human Development context ($t-1$)	2.749 (2.774)	2.749 (2.774)	4.751** (2.196)	2.118 (4.129)	2.118 (4.129)	4.206 (2.891)
Entrepreneurial and Business Skills						
Ln Opportunity recognition ($t-1$)	0.269*** (0.093)	0.269*** (0.093)	0.250*** (0.075)	0.144 (0.177)	0.144 (0.156)	0.114 (0.114)
Financial assistance						
Ln Private credit coverage ($t-1$)	0.169** (0.077)	0.169** (0.077)	0.117** (0.059)	0.347** (0.156)	0.347** (0.156)	0.252** (0.112)
Non-Financial Assistance						
Ln Access to communication ($t-1$)	0.856*** (0.322)	0.856*** (0.322)	0.849*** (0.259)	0.161 (0.639)	0.161 (0.639)	0.752* (0.410)
Control variable						
GDP growth rate ($t-1$)				-0.033 (0.028)	-0.033 (0.028)	-0.033 (0.024)
Ln Population density ($t-1$)				-0.313* (0.183)	-0.313* (0.183)	-0.322** (0.159)
Population older 15 years old ($t-1$)				0.018 (0.091)	0.018 (0.091)	0.015 (0.079)
(Population older 15 years old) ² ($t-1$)				-0.000	-0.000	-0.000

				(0.001)	(0.001)	(0.001)
Constant	-0.320	-0.320	0.215	1.429	1.429	1.955
	(0.792)	(0.792)	(0.656)	(1.740)	(1.740)	(1.248)
R^2	0.359	0.359	0.359	0.505	0.505	0.505
Equation 2. Dep. variable Y/L	Ln Y/L	Ln Y/L	Ln Y/L	Ln Y/L	Ln Y/L	Ln Y/L
Ln TEA opp ($t-1$)	0.002	0.060*	0.062**	0.002	0.067*	0.076***
	(0.010)	(0.034)	(0.027)	(0.014)	(0.036)	(0.029)
Ln Capital ($t-1$)				0.205***	0.200***	0.182***
				(0.029)	(0.035)	(0.027)
Ln Government consumption ($t-1$)				-0.038	-0.083	-0.109
				(0.088)	(0.111)	(0.075)
Ln Exports ($t-1$)				-0.136	-0.136	-0.132*
				(0.099)	(0.099)	(0.080)
Ln Health expenditure ($t-1$)				0.095***	0.078*	0.095***
				(0.034)	(0.043)	(0.028)
Constant	0.000	0.000	0.000	3.833	3.997	4.484***
	(0.000)	(0.000)	(0.000)	(0.723)	(0.897)	(0.687)
Time fixed-effects	No	No	No	Yes	Yes	Yes
Country fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	50	50	50	46	46	46
R^2	0.993	0.987	0.987	0.987	0.998	0.997
<i>Hausman Specification Tests</i>						
2SLS vs. OLS	0.000			0.000		
3SLS vs. OLS	1.000			0.999		
3SLS vs. 2SLS	1.000			0.999		

Note: + p = 0.10; * p < 0.10, ** p < 0.05; *** p < 0.01. Standard errors in parentheses. Dep. variable: Dependent variable. Estimates for country and time fixed-effects dummies are not presented but can be supplied upon request.

Another institutional environment was assessed through hypothesis 2, which suggests that a more favorable human development context has a positive influence on entrepreneurial activity in developing countries. Model 3 reveals a positive and significant influence of this variable on TEA opp ($b = 4.751$, $p < 0.05$), partially supporting hypothesis 2. The results suggest that a more advanced development context concerning the quality of life and standard of living generates an entrepreneurial environment for those individuals who perceive the opportunity to create a business. Similar to the previous hypothesis, by comparing our results with Appendix 2, we found a lower influence on entrepreneurial activity in developing countries than in all countries. This is consistent with other results, which suggest that the development stage matters in those countries with a certain maturity in terms of standard of living (Carree et al. 2002, 2007). Perhaps, as Cumming et al. (2014) have found, this sort of environmental factor might be a complementary element when explaining growth. This would mean that societies in developing countries push forward productivity in the presence of both appropriate economic conditions and opportunity entrepreneurship. Overall, following Gnyawali and Fogel (1994), this environment provides a level of social stability, in which education, health insurance, perfect markets (accurate prices and guaranteed quantities), and higher levels of income are generated for and by all parts of society.

Regarding the third institutional environment, hypothesis 3 suggests that opportunity recognition has a positive influence on entrepreneurial activity in developing countries. This hypothesis is also partially supported by our data, as model 3 shows a positive and statistically significant effect ($b = 0.250$, $p < 0.01$). This result is consistent with the existing debate about opportunity recognition, as other scholars argue that the capacity to perceive opportunities increases the rates of TEA opp (Arenius and De Clercq 2005; Baron 2006; Baron and Ensley 2006). It is very striking that for all countries, the coefficient is highly significant for models 3 and 6 (see Appendix 2). These particular results suggest that the ability to perceive the opportunities is relevant in an entire sample of developed and developing countries. Overall, a long-term policy of education and entrepreneurial culture should be implemented. In line with Ozgen and Baron (2007), an environment where different actors (entrepreneurs, scientists, government, and civil society) constantly interact is primarily the result of a well-functioning basic and higher education strategy, and secondly, has an element of building up the ecosystem needed to create opportunities. However, as Fuentelsaz et al. (2019) and Stenholm et al. (2013) suggest, opportunity recognition might have a role in encouraging business alertness (consistent with the notion of informal institutions) and thus may be a moderator of the relationship implied in developing countries.

Hypothesis 4, which suggests that access to bank credit has a positive influence on entrepreneurship in developing countries, is supported by our results. Models 3 and 6 show a positive effect of access to bank credit on entrepreneurial activity in developing countries ($b = 0.117$, $p < 0.05$; and $b = 0.252$, $p < 0.05$), as well as in all countries (model 6: $b = 0.120$, $p < 0.01$). According to the literature, this effect on developing countries is higher with respect to all the countries in the sample, meaning that the banking system is an important element of entrepreneurial development in these economies – one that provides support for

entrepreneurs and SMEs. In this regard, access to credit should overcome internal problems such as unemployment and underemployment, as Martínez and Puentes (2018) suggest. Uncertainty caused by social conditions could generate distrust in the financial system, hindering its role in entrepreneurial activity, according to Stiglitz and Weiss (1981). Comparing our results with those of other scholars, such as Aparicio et al. (2016a), we obtain a consistent coefficient in our hypothesis and sub-hypothesis, similar to these authors, who obtain a positive and statistically significant coefficient of credit access in Latin American countries. Our results suggest that the importance of a financial structure that supports entrepreneurial ideas based on knowledge and innovation is still relevant.

Hypothesis 5, which suggests that access to communication has a positive influence on entrepreneurial activity in developing countries, is supported by our data. For example, model 3 shows a strong significant effect ($b = 0.849$, $p < 0.01$), which is also similar to model 6 ($b = 0.752$, $p < 0.1$). The literature points out that the infrastructure, and specifically access to communication, encourages the rate of entrepreneurial activity (Audretsch et al., 2015; Padilla-Pérez and Gaudin, 2014). Likewise, by comparing with Appendix 2, we found a positive and significant effect on TEA opp in both developed and developing countries. Models 3 and 6 in Appendix 2 show that this variable has a positive and significant influence on entrepreneurial activity in all countries ($b = 0.785$, $p < 0.01$; and $b = 0.692$, $p < 0.01$). According to Audretsch et al. (2015) and Benet (2019), the infrastructure is a source of competitiveness in which entrepreneurs participate through the development of new products and services. To achieve an increased network that is useful for the value chain of new ventures, it is important that governments in developing countries guarantee and regulate – in favor of households and businesses – the communication infrastructure, which involves broadband, phone, and mobile services, among others. This issue is discussed in the work of Padilla-Pérez and Gaudin (2014), who analyze the importance of communication in Central American countries, paying attention to entrepreneurship and innovation as key elements for economic growth.

The last hypothesis analyzed in this paper posits that economic growth is influenced positively by opportunity entrepreneurship in developing countries. According to models 3 and 6, we find that opportunity entrepreneurship has a positive effect on economic growth ($\beta_1 = 0.062$, $p < 0.05$; and $\beta_1 = 0.076$, $p = 0.01$). Additionally, Appendix 2 shows that the effect is also positive if we consider a larger sample of countries ($\beta_1 = 0.207$, $p < 0.01$; and $\beta_1 = 0.157$, $p < 0.01$). According to Wong et al. (2005), entrepreneurial activity influenced by opportunities tends to impact positively on economic development. However, they do not find statistically significant evidence. In contrast, our results suggest that – on average – for all countries in our sample, if TEA opp increases by 1%, the GDP in proportion to the size of the laboring population will increase by 0.157% (model 6, Appendix 2) and 0.076% for developing countries (model 6), *ceteris paribus*. This is consistent with Audretsch and Keilbach's (2004a) results. According to them, the entrepreneurship associated with innovation has a positive impact on economic performance. Furthermore, we point out that the effect of TEA opp on economic growth does not differ significantly among these countries. This idea, supported by Valliere and Peterson (2009), suggests that those countries that encourage entrepreneurial activity based on innovation could obtain improved outcomes

in terms of economic performance. Therefore, we could suggest that entrepreneurship has a relevant role in promoting economic development, in which institutional endowment is a factor that has a relevant influence. In addition, according to Ferreira et al. (2017), Mueller (2007), and Braunerhjelm et al. (2010), entrepreneurial activity based on innovation is one missing link in converting knowledge as an implicit factor into the growth process; therefore, spillovers could be obtained to increase economic development.

5. Discussion and conclusions

In this paper, unbalanced panel data for developing countries (for the period of 2004–2012) were used to explore the interrelationships among the institutional environment, entrepreneurial activity, and economic growth. Using the conceptual framework of institutional economics, we analyzed the influence of institutions (the number of procedures involved in starting a business, the human development context, opportunity recognition, private credit coverage, and access to communication) on entrepreneurship (opportunity TEA), which at the same time facilitates economic growth. Although we have paid special attention to context of developing countries, we have also provided evidence for a larger sample of developed countries and emerging economies. For these nations, the institutional environment exerts a greater influence on entrepreneurial activity and, consequently, on economic growth.

This research generated two key results. First, there is evidence of a relationship between institutional environments and entrepreneurship. This is in line with recent results from entrepreneurship scholarship, which suggest that institutions play a key role in explaining entrepreneurial activity, especially entrepreneurial activity that is driven by opportunity (Stenholm et al. 2013). Here, our results have suggested that most of the environments proposed by Gnyawali and Fogel (1994) have a significant impact on opportunity entrepreneurship in developing countries. In this case, entrepreneurship related to innovation reacts with three out of the five institutional environments (government policies and procedures, socioeconomic conditions, and financial assistance). Furthermore, we found a positive relationship between entrepreneurial activity and economic growth. Here, entrepreneurial activity (i.e. opportunity TEA) encourages economic growth. These results suggest that entrepreneurship could be a key factor in achieving growth. Therefore, it is important that policymakers aim to develop strategies that encourage individuals with growth aspirations to become entrepreneurs. Second, by unifying the two separate strands of entrepreneurship research (Carlsson et al. 2013; Urbano et al. 2019a,b), it is possible to argue that the causal chain going from institutions through to entrepreneurship and economic growth is an important tool to discuss public policies, especially in developing countries. Hence, those institutions – measured through different environments – encourage entrepreneurial activity, which in turn fosters economic growth.

Although the explicit analysis of entrepreneurial activity originated with Schumpeter's seminal 1911 book, many scholars from other disciplines have been motivated to explore such a phenomenon from their own perspectives (Carlsson et al. 2013). According to Alvarez et al. (2015), Bruton et al. (2010), and Thornton et al. (2011), most researchers in the

entrepreneurship field have been interested in exploring economic, psychological, sociological, and anthropological factors, among others. Nonetheless, different approaches have led to disparate ideas, ranging from antecedents and consequences of entrepreneurship, but not to a common view that embraces the entire complexity involved in entrepreneurial activity. It is important to clarify that institutions and entrepreneurship may be complementary (cf. Bjørnskov and Foss 2013; Cumming et al. 2014), which is why some institutional factors (i.e. the human development context and opportunity recognition) were not statistically significant in models controlled for sociodemographic characteristics. However, there has been a consensus on the role of institutions in the economic development process (Acemoglu et al. 2014; Glaeser et al. 2004). Drawing on North and Thomas (1973), scholars in economic growth and development (e.g. Acemoglu et al. 2014; Rodrik 2003) agreed with the idea that institutions are deep fundamental factors affecting those mechanisms directly linked to economic growth. This idea was also applied to the entrepreneurship field, where academics such as Aparicio et al. (2016a,b), Baumol and Strom (2007), Bosma et al. (2018), Bjørnskov and Foss (2016), and Urbano et al. (2019a,b,c) explored institutional antecedents and growth consequences of entrepreneurship and innovation. Despite this tremendous effort, most of the evidence was based on developed countries. Our study may also be viewed as an attempt to approach the complex phenomenon of entrepreneurship.

In this sense, in order to shed light on that discussion with respect to developing countries, we suggest that it is important to understand certain contexts, such as poverty and the existence of unofficial economies (Bruton et al. 2013). With regard to these issues, our findings suggest that the application of particular strategies is related to the three most significant institutional environmental characteristics that allow entrepreneurship (directly) and economic growth (indirectly) to take place.

First, governments should be aware of the entrepreneurial intentions of individuals and encourage the permanent pursuit of opportunities in order to transform such opportunities into new businesses. Achieving that could depend on having the appropriate legal framework, which involves not only reducing the number of procedures (van Stel et al. 2007), but also making the tax system and regulation capacity more manageable. These elements should encourage internal entrepreneurs as well as arriving immigrant entrepreneurs. Although this might appear trivial at first blush, the question of identifying the optimal level of regulations still persists. Based on our results, one might assume that developing countries are more sensitive to changes in the number of procedures required to start a new business, since most individuals would prefer the unofficial economy (Acs and Virgill 2010; Bruton et al. 2008). In line with Belitski et al. (2016), it could prove especially helpful to open a dialogue on defining a strategy to set up the necessary amount of regulation that would not cause the latent level of corruption to increase, but instead, would enable prosperous entrepreneurial activity, with just enough controls to discourage rent-seeking or unproductive entrepreneurship (Minniti 2016). Hence, governments should find an appropriate balance between the regulation capacity, in terms of procedures, and the need to maintain incentives to start a business.

Second, regarding financial assistance, not only removing credit constraints but also improving and increasing financial sources could be significant strategies for entrepreneurship development in developing countries. The financial system is crucial to providing sufficient tools needed by entrepreneurs, who are constantly in pursuit of opportunities. Therefore, a better ecosystem of entrepreneurship may play an important role within each developing country to articulate the agents related to entrepreneurial activity (Ács et al. 2014). Accordingly, public policies at the regional and national levels should pay attention to the systems of entrepreneurship, which are fundamentally networks that increase the entrepreneurial alertness, facilitating the creation of new firms (Arenius and De Clercq 2005). In this sense, the policies to promote entrepreneurship should envision long-term achievement in order to promote entrepreneurship with growth potential. According to Rahim and Mohtar (2015), entrepreneurs are innovators who create and exploit opportunity, consequently creating value and change in the economy and society. Therefore, financial issues are important factors to consider in the public agenda, as long as the relevant organization has an influence on economic performance. Growth and development processes might be the result of encouraging and increasing, through a better financial system structure, sustainable entrepreneurship in those developing nations (Ansari et al. 2012).

Third, although the findings are not conclusive for developing countries, it is still important to focus on one particular strategy in the non-financial assistance dimension, such as the infrastructure, which explicitly connects entrepreneurs with markets, information, and networks. The evidence for all countries contained in the sample may serve as useful bases for policy to recommendations in this regard. The physical infrastructure and other facilities should be provided by country-specific institutional characteristics in order to accomplish better results in terms of growth and welfare (Padilla-Pérez and Gaudin 2014). This means that governments, education systems, financial infrastructure, productive sectors, and civil society must constantly interact to achieve better performance in terms of increasing the number of entrepreneurs by promoting opportunity and hence achieving higher levels of inclusive economic growth. In this context, Ács et al. (2014), through the global entrepreneurship and development index, have demonstrated the countries that have the capacity to recognize the necessary elements that compose systems of entrepreneurship, as well as to identify the factors that discourage their growth aspirations and potential. Hence, Ács et al. (2014) argue that national systems of entrepreneurship may serve as building blocks along with the national systems of innovation. In this sense, it is possible to identify a loop between growth, potential ideas based on knowledge, and skills, which are interrelated with their subsequent transformation into a new firm.

Overall, the previous implications might suggest to entrepreneurship scholars that new data are appearing on the scene, and therefore, new empirical findings at all stages of the causal chain may be raised. The data and the operationalization of the variables presented in this paper might also imply that scholars have the opportunity to validate our results, particularly on whether they hold true across time and across different groups of cities, regions, and countries. One of the advantages of the macro-level data used here is that there is a continuous agenda to gather information about institutions, entrepreneurship, and economic growth. By

achieving this, it is possible to keep exploring and validating the policies needed to accomplish economic development.

Additionally, other limitations regarding the sample size (especially for developing countries), and static analysis need to be explicitly recognized. Other datasets could provide a larger sample for both heterogeneous as well as specific groups of countries with longer periods of time, which allow more precise estimators to be obtained. The idea that more instruments should be considered encourages the possibility of extending the objective presented in this paper, by exploring and including additional institutional factors into the entrepreneurship equation. Similarly, the empirical evidence provided in this paper opens new avenues in terms of identifying which other institutions affect entrepreneurial activity, which allows for enhanced economic growth. In that context, it is possible to follow the studies conducted by Aidis et al. (2008), Bruton et al. (2009), Bruno et al. (2013), and Aparicio et al. (2016a) in order to further analyze how institutional environments could also encourage entrepreneurial behavior and therefore obtain higher economic growth rates. Similar questions have been also raised when analyzing regions within countries. For example, Fritsch and Wyrwich (2018) and Stuetzer et al. (2016) have explored the deep determinants of regional entrepreneurship, which is correlated to economic growth. However, there is a lack of evidence for regions in developed countries. Scholars in this field of research might be interested in taking advantage of existing differences in terms of institutions and entrepreneurship, which create uneven development in developing countries. The main challenge is to find the appropriate data at the country and regional levels that allow for the simultaneous evaluation of the effect of the institutional environment on entrepreneurship and its subsequent impact on economic growth, with regard to a dynamic analysis.

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Appendix 1. List of countries

All countries	Developing countries	All countries	Developing countries
1 Australia		23 Mexico	X
2 Belgium		24 Netherlands	
3 Bosnia and Herzegovina	X	25 Nigeria	
4 Brazil	X	26 Norway	
5 Chile	X	27 Pakistan	X
6 China	X	28 Panama	
7 Colombia	X	29 Peru	X
8 Croatia		30 Poland	
9 Denmark		31 Portugal	
10 Finland		32 Romania	X
11 France		33 Russian Federation	
12 Germany		34 Singapore	

13	Greece		35	Slovenia	
14	Guatemala	X	36	South Africa	X
15	Hungary	X	37	Spain	
16	Iceland		38	Sweden	
17	Ireland		39	Switzerland	
18	Italy		40	Thailand	
19	Japan		41	United Kingdom	
20	Korea, Rep.		42	United States	
21	Latvia		43	Uruguay	X
22	Malaysia	X			

Note: The classification of developing countries was based on the International Monetary Fund's World Economic Outlook Report, April 2015:
<http://www.imf.org/external/pubs/ft/weo/2015/01/weodata/groups.htm>

Appendix 2. Results of simultaneous equations for a larger sample of developed and developing countries

Equation 1. Dep. variable TEA opp	(1)	(2)	(3)	(4)	(5)	(6)
	Ln TEA opp	Ln TEA opp	Ln TEA opp	Ln TEA opp	Ln TEA opp	Ln TEA opp
	(OLS)	(2SLS)	(3SLS)	(OLS)	(2SLS)	(3SLS)
Government policies and procedures						
Ln Number of procedures to start a new business ($t-1$)	-0.142 (0.099)	-0.142 (0.099)	-0.150 (0.097)	-0.168* (0.094)	-0.168* (0.094)	-0.166* (0.090)
Socioeconomic conditions						
Ln Human Development context ($t-1$)	1.229*** (0.396)	1.229*** (0.396)	1.183*** (0.387)	1.248*** (0.462)	1.248*** (0.462)	1.246*** (0.441)
Entrepreneurial and Business Skills						
Ln Opportunity recognition ($t-1$)	0.379*** (0.076)	0.379*** (0.076)	0.394*** (0.073)	0.253*** (0.089)	0.253*** (0.089)	0.249*** (0.084)
Financial assistance						
Ln Private credit coverage ($t-1$)	0.109*** (0.040)	0.109*** (0.040)	0.099** (0.039)	0.125*** (0.038)	0.125*** (0.038)	0.120*** (0.037)
Non-Financial Assistance						
Ln Access to communication ($t-1$)	0.721*** (0.260)	0.721*** (0.260)	0.785*** (0.252)	0.644** (0.272)	0.644** (0.272)	0.692*** (0.258)
Control variable						
GDP growth rate ($t-1$)				0.021* (0.011)	0.021* (0.011)	0.022** (0.010)
Ln Population density ($t-1$)				-0.058* (0.032)	-0.058* (0.032)	-0.056* (0.030)
Population older 15 years old ($t-1$)				-0.007 (0.033)	-0.007 (0.033)	-0.004 (0.032)
(Population older 15 years old) ² ($t-1$)				0.000	0.000	0.000

				(0.000)	(0.000)	(0.000)
Constant	-1.462***	-1.462***	-1.574***	-0.662	-0.662	-0.787
	(0.504)	(0.504)	(0.491)	(1.201)	(1.201)	(1.148)
R^2	0.354	0.354	0.353	0.452	0.452	0.452
Equation 2. Dep. variable Y/L	Ln Y/L	Ln Y/L	Ln Y/L	Ln Y/L	Ln Y/L	Ln Y/L
Ln TEA opp ($t-1$)	0.058***	0.183***	0.207***	0.038**	0.137***	0.157***
	(0.019)	(0.049)	(0.040)	(0.016)	(0.036)	(0.029)
Ln Capital ($t-1$)				0.102***	0.055	0.050*
				(0.027)	(0.035)	(0.028)
Ln Government consumption ($t-1$)				-0.064	-0.157*	-0.137*
				(0.075)	(0.093)	(0.075)
Ln Exports ($t-1$)				-0.117**	-0.174***	-0.172***
				(0.046)	(0.057)	(0.046)
Ln Health expenditure ($t-1$)				0.056	0.047	0.046
				(0.037)	(0.044)	(0.036)
Constant	10.962***	10.667***	10.627***	8.717***	10.171***	10.212***
	(0.060)	(0.126)	(0.103)	(0.852)	(1.102)	(0.887)
Time fixed-effects	No	No	No	Yes	Yes	Yes
Country fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	140	140	140	136	136	136
R^2	0.993	0.987	0.987	0.987	0.998	0.997
<i>Hausman Specification Tests</i>						
2SLS vs. OLS	0.000			0.000		
3SLS vs. OLS	1.000			0.999		
3SLS vs. 2SLS	1.000			0.999		

Note: * $p < 0.10$, ** $p < 0.05$; *** $p < 0.01$. Standard errors in parentheses. Dep. variable: Dependent variable. Estimates for country and time fixed-effects dummies are not presented but can be supplied upon request.

